

THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT APPROACH TO MINIMUM WATER FLOWS AND LEVELS

John C. Good

AUTHOR: Water Resources Engineer, Suwannee River Water Management District, 9225 County Road 49, Live Oak, Florida 32060.

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Abstract. As defined by Florida Statutes (F.S.), "the minimum flow for a given water course shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Section 373.042, F.S.).

The establishment of minimum water flows and levels is mandated by state law and necessary for the protection of water resources and water dependent ecosystems. Minimum flows and levels will also be used in determining the quantity of water available for withdrawal.

The Suwannee River Water Management District and the United States Geological Survey have a cooperative data collection and analysis program to develop the necessary data and management tools for the establishment of minimum flows and levels. The program includes modeling of groundwater (MODFLOW) and surfacewater (MODBRANCH) systems, and the establishment of the freshwater and hydrologic requirements of floodplain vegetation. If needed, a numerical model of the estuarine portion of the river will also be developed.

The first priority for establishment of minimum flows and levels is the lower Suwannee River. This is expected to be complete by the year 2000.

WHAT ARE MINIMUM FLOWS AND LEVELS?

The purpose of this paper is to present the approach being used by the Suwannee River Water Management District to set minimum water flows and levels for the lower Suwannee River.

As defined by Florida Statutes (F.S.), "the minimum flow for a given water course shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Section 373.042, F.S.). In concept, minimum flows and levels (MFLs) for rivers and streams are similar to "in-stream flow protection" programs used in other parts of the United States. (Comparable Florida statute language exists for water levels in lakes and aquifers.)

Simply put, a minimum flow or level is a number representing a rate of discharge (stream flow in a river, stream, or spring run) or a stage (level in a river, lake, or aquifer) below which significant harm will occur.

WHY SET MINIMUM FLOWS AND LEVELS?

Legal Requirement

In 1972 the Florida Legislature mandated that minimum water flows and levels be established. The water management districts, along with the Florida Department of Environmental Protection (FDEP), are the agencies charged with this task. The Suwannee River Water Management District (SRWMD) began its minimum flows and levels project in 1994. The first priority for the District is to set MFLs for the lower Suwannee River (Figure 1).



Figure 1. Basin Location and Project Area.

The project boundary is the reach from Branford to the river mouth, including the lower portion of the Santa Fe River. It is projected that minimum flows and levels will be set for the lower Suwannee by the year 2000.

Protect Water Resources/Ecology

By statute, withdrawals must not cause significant harm to the resource or ecology (the term ecology is used in this paper to conform to language in the state statute). Water withdrawals alter the timing, duration, and magnitude of in-stream flows. As the normal discharge regime changes, so can water-dependent ecology. Wetland flooding, seed germination, sediment delivery, algal production, aquatic plant bed maintenance, and fish feeding and reproduction are all potentially affected by withdrawals.

Determine Water Availability

The total water use in the Suwannee River basin is expected to increase to 350 million gallons per day by the year 2015 (see Figure 2). As population and industry continue to grow, there will be increasing use of the water resource. Minimum flows and levels will be used in determining the quantity of water available for those needs and the best schedule and timing for water use within the basin.

Furthermore, proposals to transport water from the Suwannee River to other parts of the state with high public use demands have been considered for many years. These proposals also must be evaluated with respect to the potential for harm to the water resources and the ecology of the Suwannee. Florida State Water Policy specifies that each area of the state must consider local sources first in developing water

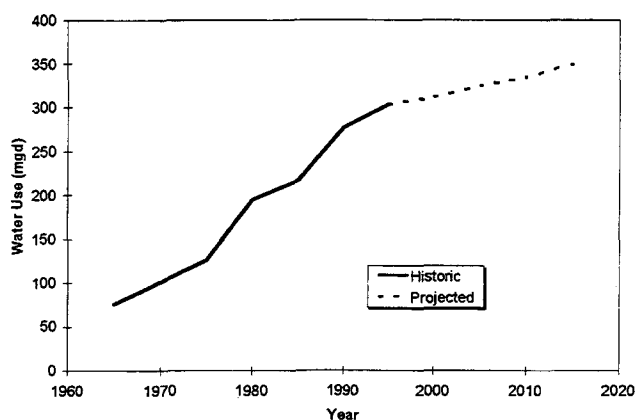


Figure 2. Historic and Projected Water Use in the Suwannee River Basin (Florida and Georgia), Source: NRCS (1996), Draft.

resources, before seeking to transfer water across hydrologic boundaries (from Chapter 62-40.310(1)(f), Florida Administrative Code).

HOW ARE MFLs DETERMINED?

Best Information Available

The water management districts are tasked with using the "best information available" to calculate MFLs. The District has been collecting water resources data throughout its 15 county area since 1976, and is actively collecting additional data for site-specific evaluations in the lower Suwannee River. This data includes rainfall, water levels, river flows, spring discharges, wetland characteristics, estuarine salinity, groundwater recharge, and tidal fluctuations.

Seasonal Variation

Where appropriate, MFLs may be calculated to reflect seasonal variations. Typical water levels in the lower Suwannee range from a 3 foot tidal fluctuation at the river mouth to a median annual range of 14.5 feet at Branford, Florida. Annual inundation of low-lying areas is common. Recorded extremes span over 32 feet (Franklin, et al., 1995). Daily mean freshwater discharges to the estuary range from 3,000 to over 84,000 cubic feet per second, based on 64 years of recorded discharges at Fanning Springs, Florida.

From this record, it is apparent that the health of the Suwannee River and associated ecosystems is dependent upon these fluctuating flows and levels. Because of this, the SRWMD will explore an approach to MFLs that entails the setting of multiple flows and levels to protect the ecology over a broad range of conditions. This technique is already in use in other parts of Florida. For example, five separate flows and levels were set for the Wekiva River by the St. Johns River Water Management District (Hupalo, et al., 1994). In each flow and level is tied to a specific duration and return period statistic. A proposed withdrawal must not cause the minimum flow or level to occur more frequently or for longer durations than the established conditions. The effects of proposed withdrawals can be checked against the established flows and levels by modeling or other predictive means. The SRWMD may use a similar approach for the lower Suwannee River.

Calculations and Models

The data collection efforts and subsequent analyses are part of a long-term cooperative program between the Tallahassee office of the United States Geological Survey (USGS) and the SRWMD. The data will be used by the USGS to develop models of the lower Suwannee River area. The models will include:

- A groundwater model of the entire District (using MODFLOW) which will be used to evaluate the effects of proposed withdrawals on groundwater resources;
- A surfacewater model of the freshwater portion of the lower Suwannee River (using MODBRANCH) which is interconnected with the groundwater model. This surfacewater model will be used to evaluate the effects of proposed groundwater and/or surfacewater withdrawals on the Suwannee River;
- Development of the relationships among floodplain vegetation and the duration and frequency of inundation of the floodplain; and
- A regression model of the relationship of salinity, tide, and freshwater inflow for the brackish portion of the river.

If needed, a numerical model of the estuarine portion of the river will also be developed. The potential for adverse impacts (significant harm) due to proposed withdrawals will be evaluated on a case-by-case basis. The changes in hydrology resulting from a proposed withdrawal, as determined through use of the models, will be compared to the hydrologic requirements of the floodplain vegetation and the freshwater requirements of the estuarine system, to determine if significant harm will occur. Exact procedures and the specific means of application of the methods have not yet been determined. Proposed water uses which are determined to violate the established minimum flows and levels designated to prevent significant harm will not meet water use permitting criteria.

The cooperative program with the USGS includes an approximate 60/40 split in funding (SRWMD/USGS) and is expected to continue until the year 2000. The total cost of these data collection and related studies will be approximately \$3.3 million.

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The University of Georgia

Institute of Ecology

Athens, Georgia 30602-2202 U.S.A.

Telephone: (706) 542-2968

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